

10th Sendai Workshop Infinite Dimensional Analysis and Quantum Probability



December 16 - 17, 2010
Graduate School of Information Sciences
Tohoku University

December 16 (Thu) Special Lectures Large Lecture Hall (2F)

13:30-17:30 **Noncommutative distributional symmetries and invariance principles.**

Introductory lectures I – III (3 Lectures + Discussion)

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Distributional symmetries and invariance principles provide deep structural theorems in classical probability. For example, the famous de Finetti theorem states that distributional invariance of an infinite sequence of random variables under finite permutations of the random variables ('exchangeability') is equivalent to the sequence being identically distributed and conditionally independent over its tail algebra. We will introduce to recent progress on the transfer of such de Finetti type results to an operator algebraic setting.

December 17 (Fri) Workshop Small Lecture Hall (AM=3F, PM=5F)

10:00-10:50 **Beurling-Fourier algebra: a weighted version of Fourier algebra**

Hun Hee Lee

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In this talk I will introduce a weighted version of Fourier algebra named Beurling-Fourier algebra. This is a non-commutative analog of weighted convolution algebras on a locally compact group, which is called the Beurling algebra. We investigate various Banach algebraic properties of this new object, especially, the case when it is isomorphic to an operator algebra.

11:00-11:50 **α -Completely positive maps on pro- C^* -algebras**

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We introduce a notion of α -completely positive maps on pro- C^* -algebras and construct a representation theorem for an α -completely positive map on a Krein C^* -module.

13:20-14:10 **Unitary Gaussian processes with independent increments**

Un Cig Ji

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We study unitary Gaussian processes with independent increments with which the unitary equivalence to a Hudson-Parthasarathy evolution systems is proved. This gives a generalization of results in [2,3] in the absence of the stationarity condition. This talk is based on a joint work with L. Sahu and K. B. Sinha [1].

[1] U. C. Ji, L. Sahu and K. B. Sinha: Characterization of unitary processes with independent increments, *Communications on Stochastic Analysis* 4 (2010), 593-614.

[2] L. Sahu, M. Schürmann and K. B. Sinha: Unitary processes with independent increments and representations of Hilbert tensor algebras, *Publ. R.I.M.S., Kyoto Univ.* 45 (2009), 745-785.

[3] L. Sahu and K. B. Sinha: Characterization of unitary processes with independent and stationary increments, *Ann. Inst. Henri Poincaré, Probabilités et Statistiques* 64 (2010), 575-593.

14:20-14:50 ***Universal product and independence***

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We give a brief review on the notion of universal product for (noncommutative) probability spaces and the notion of (noncommutative) stochastic independence for subalgebras of a probability space.

14:50-15:20 ***Probability measures on C arising from continuous dual Hahn polynomials with special parameters***

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In this talk, we shall present new probability measures on C , which can be expressed by the classical Mellin convolution product of the modified Bessel functions. Our measures on C are obtained from the Jacobi-Szegő parameters for the continuous dual Hahn polynomials $S_n(x^2, a, b, c)$ under the special choice of parameters a, b, c . The most interesting things are that the classical Mellin convolution of two modified Bessel functions can be expressed again in terms of the modified Bessel functions by choosing parameters a, b, c appropriately. These results go farther than our previous results (2009). The origin of our research in this direction goes back to the Bargmann-Fock representation of the classical non-Gaussian random variables since 2003. Our results would have a potential to be connected with the higher powers of creation and annihilation operators acting on a new class of one mode interacting Fock spaces.

15:30-16:00 ***Asymptotic spectral analysis of a generalized N -cube by a quantum probabilistic method***

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We construct a growing graph such that the Jacobi coefficient of the asymptotic spectral distribution is $(\{\omega_n = n(2n-1)\}, \{\alpha_n = 2\sqrt{2(n-1)}\})$. The distribution is a χ^2 -distribution with 1 degree of freedom normalized to have mean 0 and variance 1.

16:00-16:30 ***Join of one-mode interacting Fock spaces and applications***

Nobuaki Obata
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One-mode interacting Fock spaces, equivalent to the orthogonal polynomials, is a fundamental concept in quantum probability theory and have many applications. Among others, they are useful in computing the spectral distributions of (growing/large) graphs. However, in order to study more general classes of graphs we need to generalize the concept of one-mode interacting Fock spaces, and in this line we introduce the new notion of join of one-mode interacting Fock spaces. We derive an integral expression for the m -th moment of the associated operator, regarded as a generalization of the well-known Karlin-McGregor formula for the m -step transition probability of a nearest-neighbor random walk on the non-negative integers. Some related questions are also discussed.

16:40-17:30 *Remark on infinite dimensional Laplacians associated with higher order derivatives of white noise*

Kimiaki Saitô

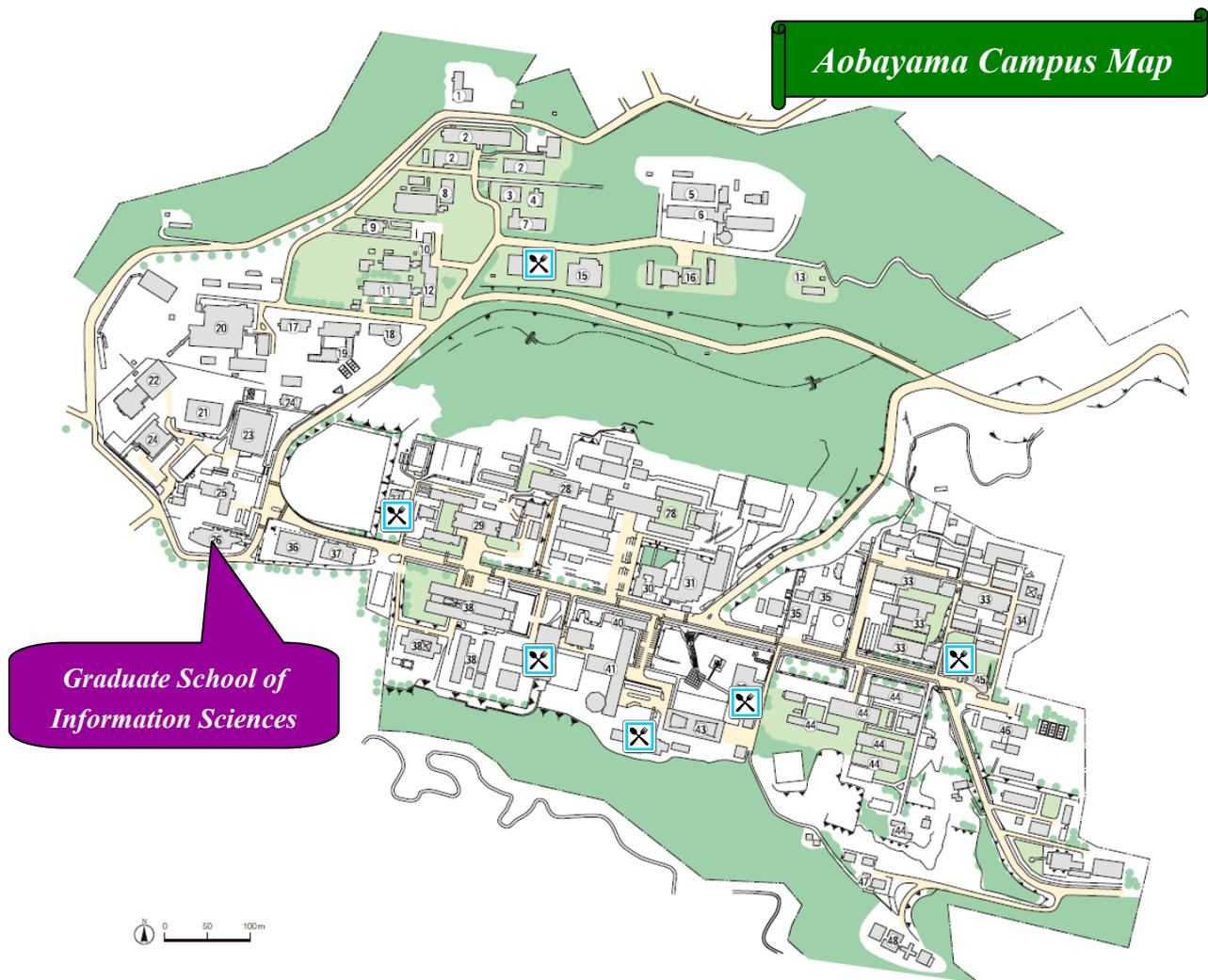
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In this talk, we present a generalization of the result in [1] on a relationship between the exotic Laplacians and the Lévy Laplacians in terms of the higher order derivatives of white noise by a modification of the Accardi-Smolyanov theorem in [2]. Moreover, we study a relationship between exotic Laplacians, acting on higher order singular functionals, each other in terms of the second quantization of the adjoint operator of the higher order differentiation. These relationships imply an interesting result on infinite dimensional stochastic processes generated by exotic Laplacians.

[1] L. Accardi, U. C. Ji and K. Saitô: Infinite dimensional Laplacians and higher order derivatives of white noise, to appear in IDAQP (2011).

[2] L. Accardi and O. G. Smolyanov: Generalized Levy Laplacian and Cesàro means, Doklady Akademii Nauk 424 (2009), 583-587.



Organizing Committee

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“Non-Commutative Harmonic Analysis with Applications to Real World Complex Phenomena”